DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 25, 2011 has been entered.

Status of Claims

2. Claims 8-23 are currently under examination wherein no claim has been amended and claims 17-22 have been newly in applicant's amendment filed on January 25, 2011; and claim 8 has been amended and claim 23 has been newly added in applicant's amendment filed on February 10, 2011.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 17 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In claim 17, "at least 20 °C" is not supported by the

instant specification. The applicant is required to identify the supports for any new claim limitations in new or amended claims from the instant specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 8-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goudarzi el al. (US Pub. 2006/0021466 A1).

With respect to claims 8-12, 14-16, 19-21 and 23, Goudarzi el al. ('466 A1) discloses a lead-free solder paste (paragraphs [0007]-[0015]) comprising a first solder alloy powder comprising Sn, Ag and at least one additional metal selected from the group consisting of Cu, Zn, Bi, Ni, and In (e.g. a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy as claimed in the instant claims 9-12, 14, 19 and 20), a second alloy powder comprising more preferably Sn and Ag (e.g. a Sn-Ag alloy as claimed in the instant claims 9-12), and a flux, wherein both the first and second solder alloys contain by weight 2.3-4.3% of Ag (indicating that the Ag content in the overall composition after melting is 2.3-4.3%) and the liquidus temperature (reading on the claimed main peak temperature measured by differential thermal analysis) of the first solder alloy is lower than that of the second solder alloy by not greater than 15 °C as claimed in the instant claims 8 and 15.

Goudarzi el al. ('466 A1) does not specify the content of In in the overall composition as claimed in the instant claims 8 and 16; the content of In in the first solder

alloy powder as claimed in the instant claims 10, 12, 14 and 20; and the content of Bi in the first solder alloy powder as claimed in the instant claim 21. However, one of ordinary skill in the art would expect that the contents of In or Bi in the overall composition and in the first solder alloy powder of Goudarzi el al. ('466 A1) would overlap the instantly claimed contents because the elements in the first and second solder alloy powders of Goudarzi el al. ('466 A1) (e.g. a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy as the first solder alloy powder and a Sn-Ag alloy as the second solder alloy powder) are the same as those in the instantly claimed first and second solder alloy powders; the contents of Ag in the first and second solder alloy powders of Goudarzi el al. ('466 A1) overlap the instantly claimed contents; and the difference in the liquidus temperatures of the first and second solder alloy powders required by Goudarzi el al. ('466 A1) which would obviously depend on the content of In or In and Bi to be added to the first solder alloy powder overlaps the instantly claimed difference in the main peak temperatures. A prima facie case of obviousness exists. See MPEP 2144.05 I. The 0 mass % of the contents of Bi and Cu in the instant claim 8 does not require the presences of these elements.

With respect to claim 13, Goudarzi el al. ('466 A1) discloses that more preferably the second alloy comprises Sn and Ag (paragraph [0009]), suggesting that other elements can be included in the second alloy as desired. Goudarzi el al. ('466 A1) further discloses a solder paste comprising a Sn-Ag solder powder and additive powders comprising Sn, Ni, Cu, Ag and Bi (paragraph [0005]). It would have been obvious to one of ordinary skill in the art to add Cu or Bi and Cu to the second solder

alloy of Goudarzi el al. ('466 A1) (i.e. the Sn-Ag alloy) as disclosed by Goudarzi el al. ('466 A1) (paragraph [0005]) in order to improve the properties of the lead-free solder as disclosed by Goudarzi el al. ('466 A1) (paragraphs [0003]-[0006]).

With respect to claim 17, Goudarzi el al. ('466 A1) discloses that the liquidus temperature of the first solder alloy is lower than that of the second solder alloy by not greater than 15 °C (paragraph [0007]) without specifying the claimed range of at least 20 °C. However, it is well held that discovering an optimum value of a result-effective variable involves only routine skill in the art. In re Boesch, 617, F.2d 272, 205 USPQ 215 (CCPA 1980). In the instant case, the liquidus temperature difference between the first and second solder alloy powders is a result effective variable, because it would directly affect reducing or eliminating undesirable tomb stoning effects during the reflow process as disclosed by Goudarzi el al. ('466 A1) (paragraph [0006]). Therefore, it would have been obvious to one skilled in the art to have optimized the difference in order to reduce or eliminate undesirable tomb stoning effects during the reflow process. See MPEP 2144.05 II.

With respect to claim 18, the first solder alloy powder of a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy disclosed by Goudarzi el al. ('466 A1) as discussed above would be free of Cu as claimed. The second solder alloy powder of a Sn-Ag-Cu alloy suggested by Goudarzi el al. ('466 A1) as discussed above would meet the limitation of the second solder alloy powder as claimed. The reasons for the rejections of claims 13; and 10, 12, 14, 20 and 21 as stated above are further applied.

With respect to claim 22, the reason for the rejections of claims 13; and 10, 12, 14, 20 and 21 as stated above are further applied.

Response to Arguments

5. The applicant's arguments filed on January 25, 2011 have been fully considered but they are not persuasive.

First, the applicant argues that there is no specific disclosure in Goudarzi el al. ('466 A1) of any Sn-Ag-In alloys or Sn-Ag-In-Bi alloys, and even if a person skilled in the art were to conclude that such alloys could be employed as the first alloy, he would have no idea as to the permissible contents of In and/or Bi; a person skilled in the art would reason that the suitable content of In in the first alloy, whether in a Sn-Ag-In alloy or a Sn-Ag-Cu-In alloy is at most 5 wt %. In response, see the reasons for the rejections of claimed first alloy of a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy and the content of In or In and Bi in these alloys above. The rejection was based on the prior art's broad disclosure rather than preferred embodiments. See MPEP 2123. The first solder alloy powder of Goudarzi el al. ('466 A1) would be free of Cu as claimed. The content of In or In and Bi to be included in the first solder alloy powder of Goudarzi el al. ('466 A1) or the content of Cu or Bi to be included in the second solder alloy powder of Goudarzi el al. ('466 A1) is obviously limited by the difference in the liquidus temperatures of the first and second solder alloy powders required by Goudarzi el al. ('466 A1). It is noted that Goudarzi el al. ('466 A1) does not limit the In content below 5 wt % for the first solder alloy of a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy. The limitation only applies to the content of In as a fourth element to be added to a Sn-Ag-Cu alloy to form a Sn-Ag-Cu-In alloy.

Second, the applicant argues that the only option presented in Goudarzi el al. ('466 A1) for the second alloy is a Sn-Ag alloy and there is no suggestion in Goudarzi el al. ('466 A1) of a solder paste in which each of a first alloy and a second alloy has three or more components, as set forth in claim 13 and claim 14 which depends from claim 13. In response, the examiner notes that as discussed above, Goudarzi el al. ('466 A1) discloses a first solder alloy powder comprising Sn, Ag and at least one additional metal selected from the group consisting of Cu, Zn, Bi, Ni, and In (e.g. a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy as claimed in the instant claims 9-12, 14, 19 and 20), a second alloy powder comprising more preferably Sn and Ag (e.g. a Sn-Ag alloy as claimed in the instant claims 9-12) (paragraphs [0007]-[0015]) suggesting that other elements can be included in the second alloy as desired. Goudarzi el al. ('466 A1) further discloses a solder paste comprising a Sn-Ag solder powder and additive powders comprising Sn, Ni, Cu, Ag and Bi (paragraph [0005]). It would have been obvious to one of ordinary skill in the art to add Cu or Bi and Cu to the second solder alloy of Goudarzi el al. ('466 A1) (i.e. the Sn-Ag alloy) as disclosed by Goudarzi el al. ('466 A1) (paragraph [0005]) in order to improve the properties of the lead-free solder as disclosed by Goudarzi el al. ('466 A1) (paragraphs [0003]-[0006]).

Conclusions

6. This Office action is made non-final. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Weiping Zhu whose telephone number is 571-272-6725. The examiner can normally be reached on 8:30-16:30 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Emily Le can be reached on 571-272-0903. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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5/2/2011

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